EDUCATING HEALTH PROFESSIONALS IN THE ERA OF UBIQUITOUS INFORMATION

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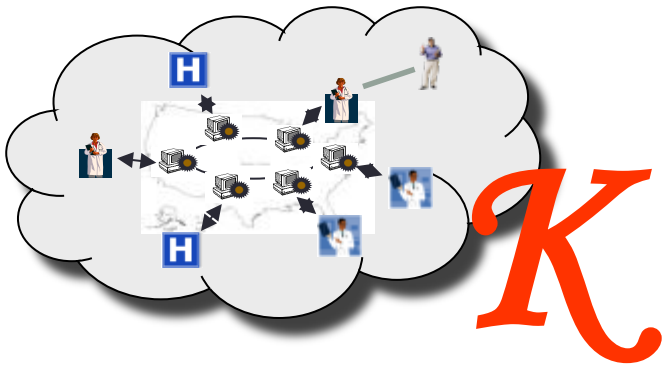


CLIC Big Sky
September 30, 2013

Skate to Where the Puck is Going to Be

Wayne Gretzky

Main Menu

- Envisioning the Informational Future
  - What can we reasonably expect by 2020 (plus or minus)?
- Implications for Health Professions Education
  - How do we skate to where the puck is going to be?
  - How should these changes shape what we do as educators?
  - What kinds of research are needed to guide us?

Time Orientation (2020)

Assuming the average age of a student entering medical school this fall is 25, the average student…

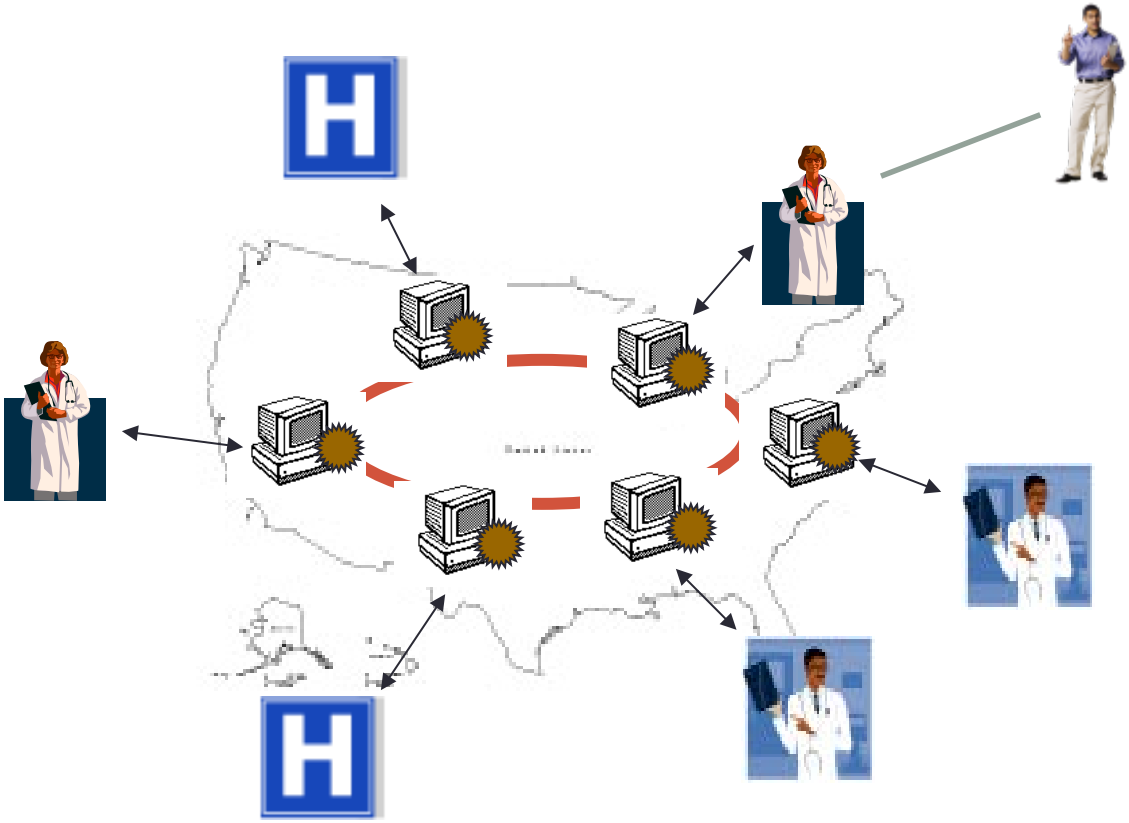
- Was 5 y.o. when the first web browser was introduced
- Will enter practice in ~ 2020

So let's skate to 2020!

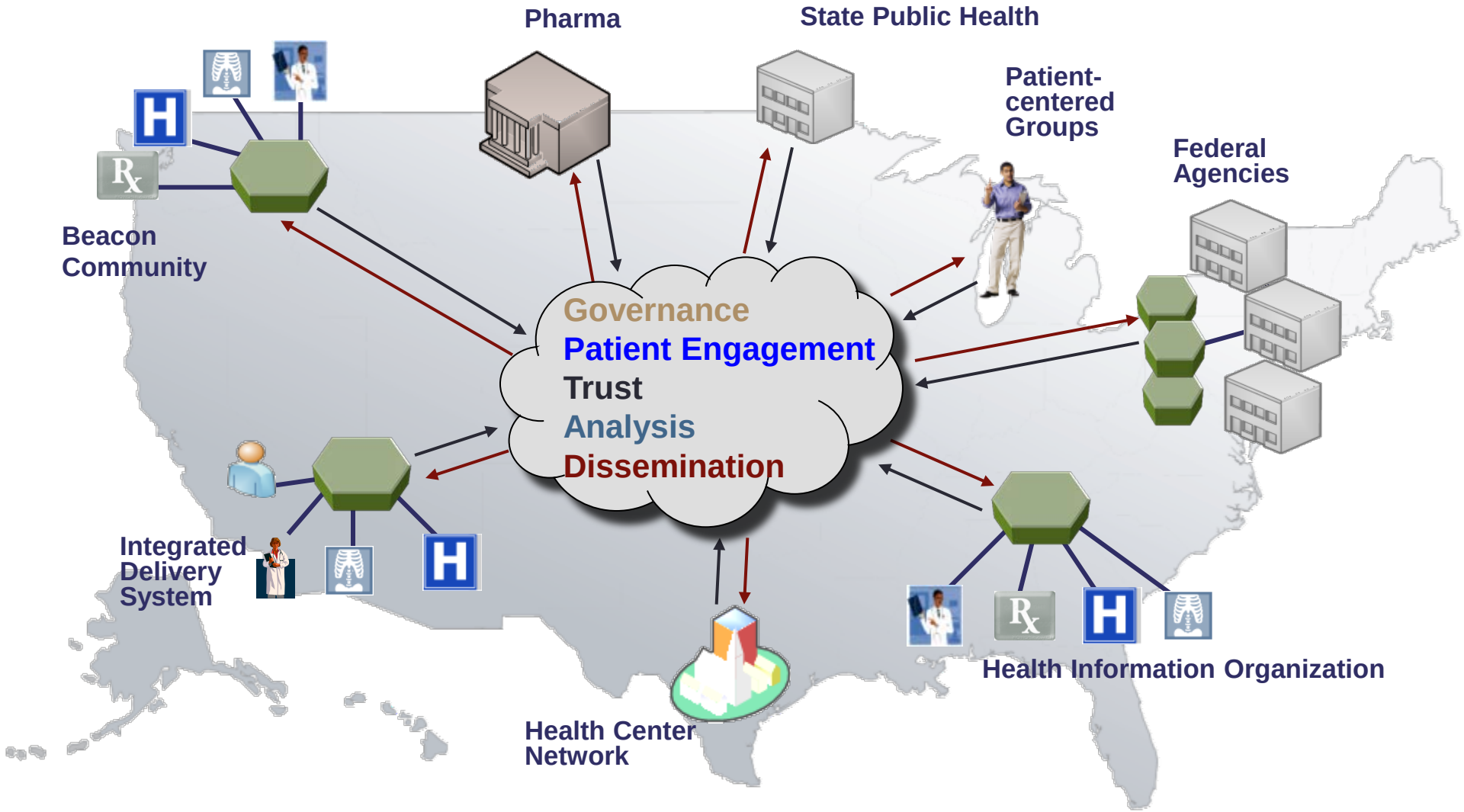
The Informational Future

1. By 2020, the U.S. will have (most of) a digital health system
   - Electronic Health Records (EHRs) will be nearly ubiquitous, making health data computable and fluid
   - Computable data will be increasingly woven into a “Learning Health System”
   - Data will be genomic, phenomic, and other “-omic”, enabling personalized care
2. Health care practice will be supported by a “knowledge cloud” integrated with consumer- and care provider-facing systems
   - Scientific knowledge
   - Best practices

Ubiquitous EHRs with Data Fluidity



A Learning Health System for the U.S.

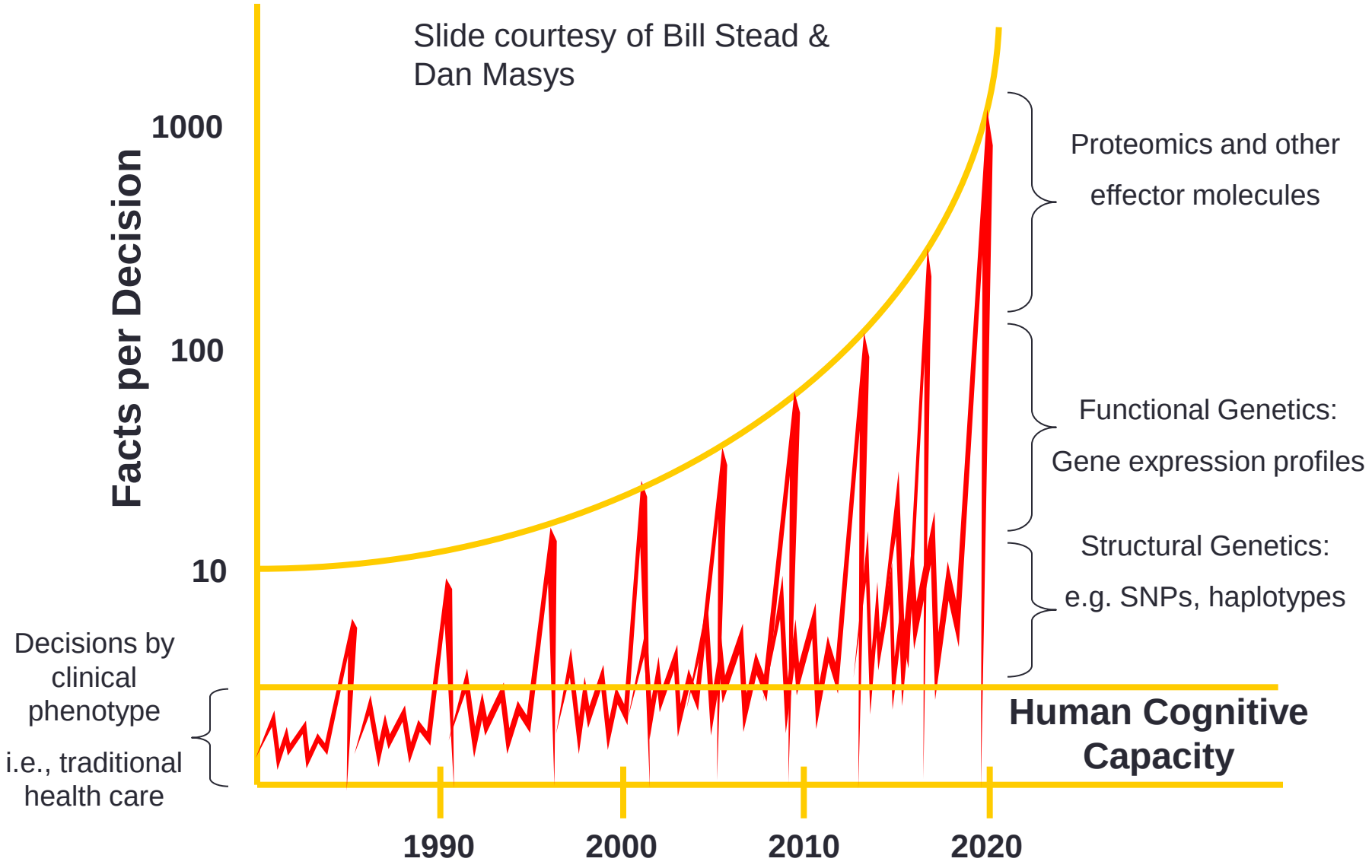


Learning System Scenarios*

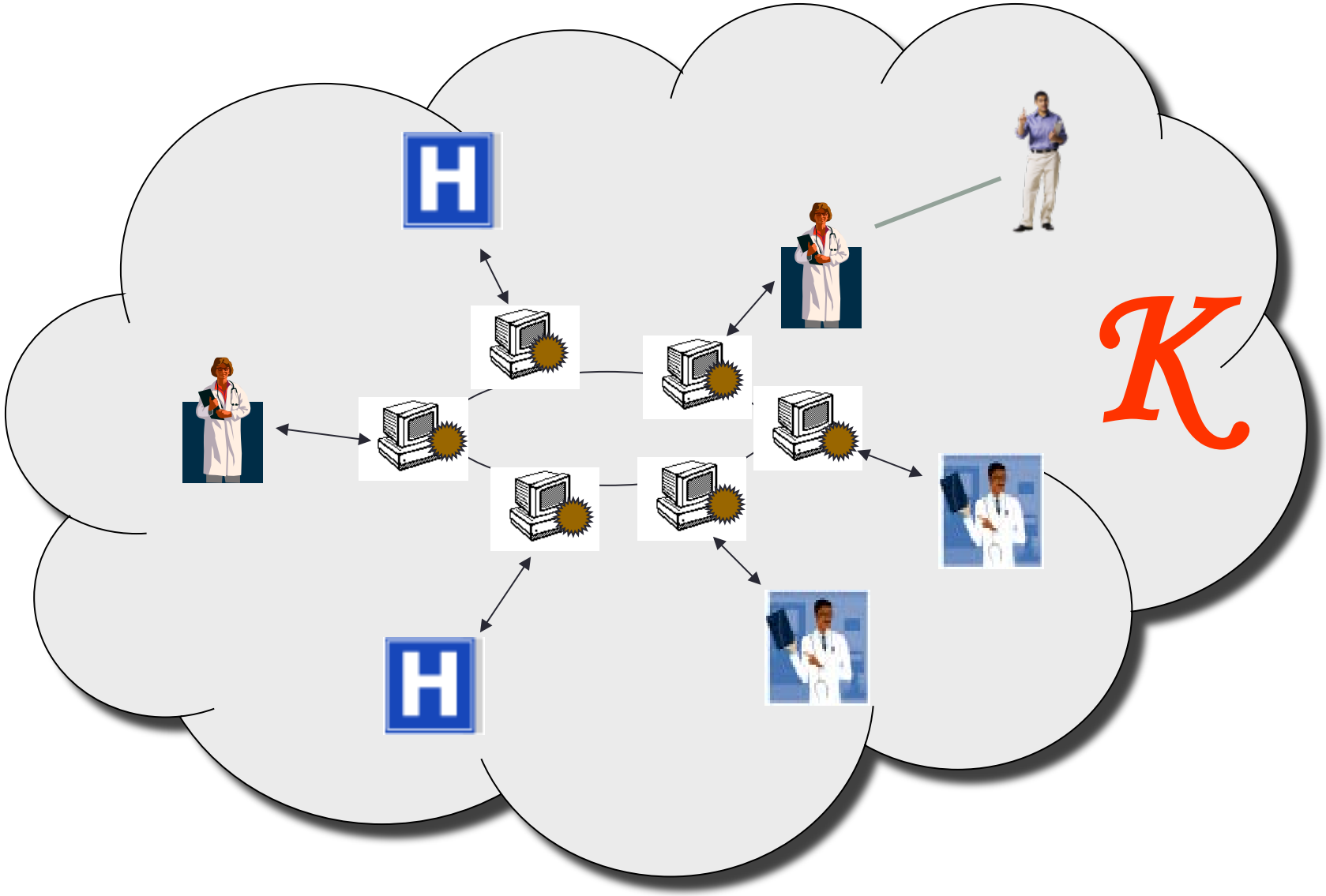
- Nationwide post-market surveillance of a new drug quickly reveals that personalized dosage algorithms require modification. A modified decision support rule is created and is implemented in EHR systems.
- During an epidemic, new cases reported directly from EHRs. As the disease spreads into new areas, clinicians in those areas are alerted.

***Digital Infrastructure for the Learning Health System: The Foundation for Continuous Improvement in Health and Health Care.**
http://www.nap.edu/catalog.php?record_id=12912
Best Care at Lower Cost: The Path to Continuously Learning Health Care in America.
www.iom.edu/bestcare

Genomic Data and Decision Making



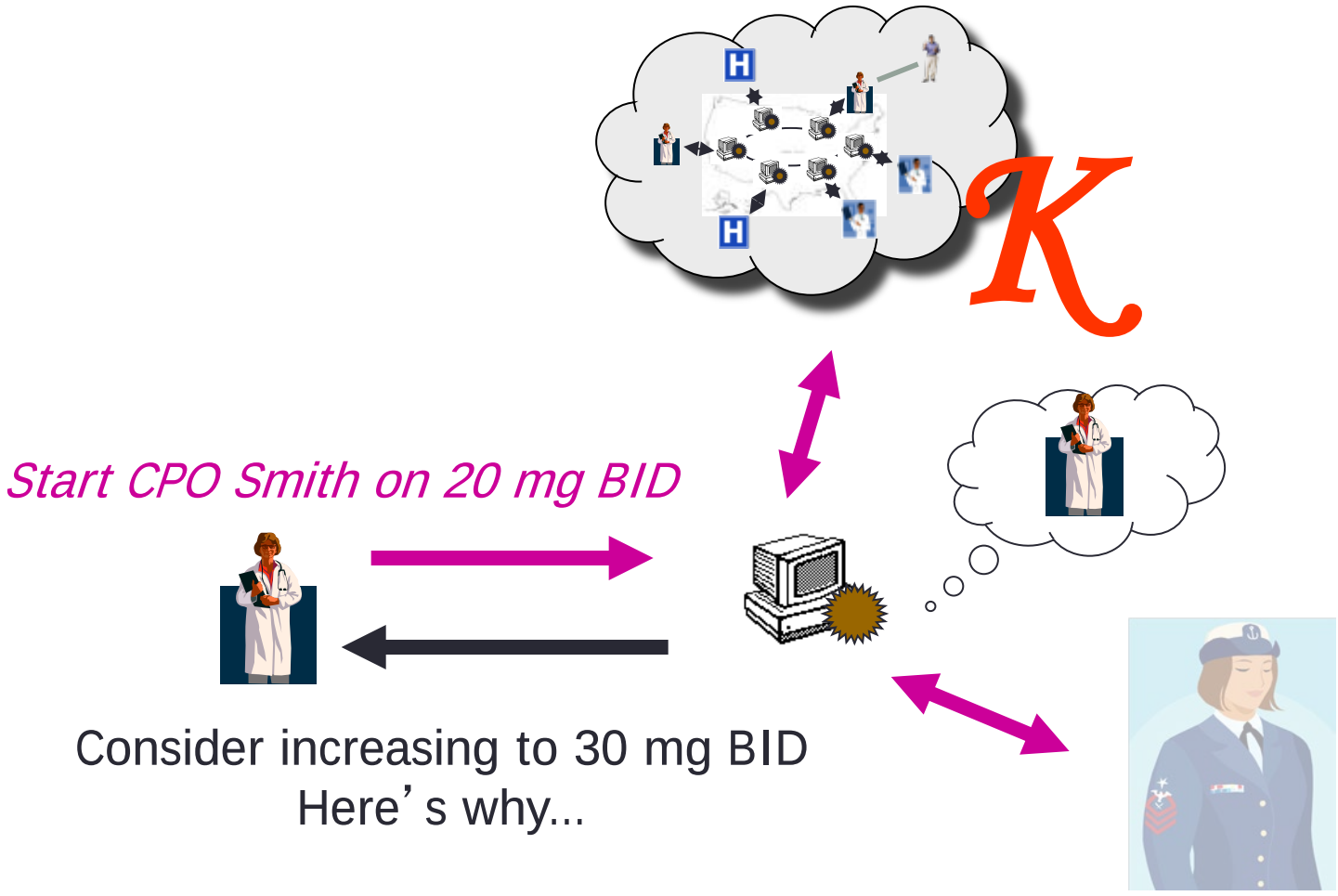
Health Care Embedded in a “Knowledge Cloud”



Composition of the Cloud

- Knowledge elements
  - Clinical guidelines
  - Drug-drug, drug-allergy interactions
  - Genome-phenome relationships
  - Biomedical literature and “predications” derived from it
  - Decision models
- Curation, to ensure accuracy and maintain currency
- Ability to answer questions and offer advice

A Knowledge Cloud Scenario



“Watson” Comes to Medicine

IBM's 'Jeopardy' computer lands health care job
CNN Money, Sept 12, 2011

“IBM is partnering with WellPoint, a large health insurance plan… to bring Watson technology to the health care sector,”

IBM Developerworks
http://www.ibm.com/developerworks/industry/library/ind-watson/

“It seems that Watson’s very first real world application is going to be in healthcare.”

PHOTO: JULIANNE PEPITONE/CNNMONEY

Recap: The Informational Future

1. By 2020, the “first world” will have (most of) a digital health care system
   - Electronic Health Records (EHRs) will be nearly ubiquitous, making health data computable and fluid
   - Computable data will be increasingly woven into a “Learning Health System”
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   - Scientific knowledge
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In Sum

Best practice will be, in part, remembered and, in part, computed

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- Implications for Health Professions Education
  - How do we skate to where the puck is going to be?
  - How should these changes shape what we do as educators?
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Implications for Health Professions Education

- I will introduce three key competencies
- For each competency, I will
  - Define and describe it
  - Suggest some educational approaches that will develop and/or assess the competency
- Since we are feeling our way along, I will close with some key research questions

Three Competencies that Would Seem to be Important

1. Knowing what you do and don't know.

   Competent clinicians will be "calibrated". Their confidence will align with their correctness. They will know when to ask.

2. Performing with support from the knowledge cloud.

   Competent clinicians will combine knowledge in their heads with knowledge in the world. They will be able to phrase a question and find an answer.

3. Evaluating and weighing evidence.

   Competent clinicians will be discriminating users of the cloud. They will be able to make decisions in the face of vague and sometimes conflicting information.

Competency 1. Knowing What You Do and Don't Know: Confidence Calibration Matrix*

Clinician Believes He/she:	Clinician Really Is: Correct	Clinician Really Is: Incorrect
Is Correct	Calibrated: OK	Miscalibrated: Unsafe
Is Incorrect	Miscalibrated: But Usually Safe	Calibrated: OK

*Friedman CP, Gatti GG, Franz TM, Murphy GC, Wolf FM, Heckerling PS, Fine PS, Miller TM, Elstein AS. Do physicians know when their diagnoses are correct? Implications for decision support and error reduction. *Journal of General Internal Medicine*, 20: 334-339, 2005.

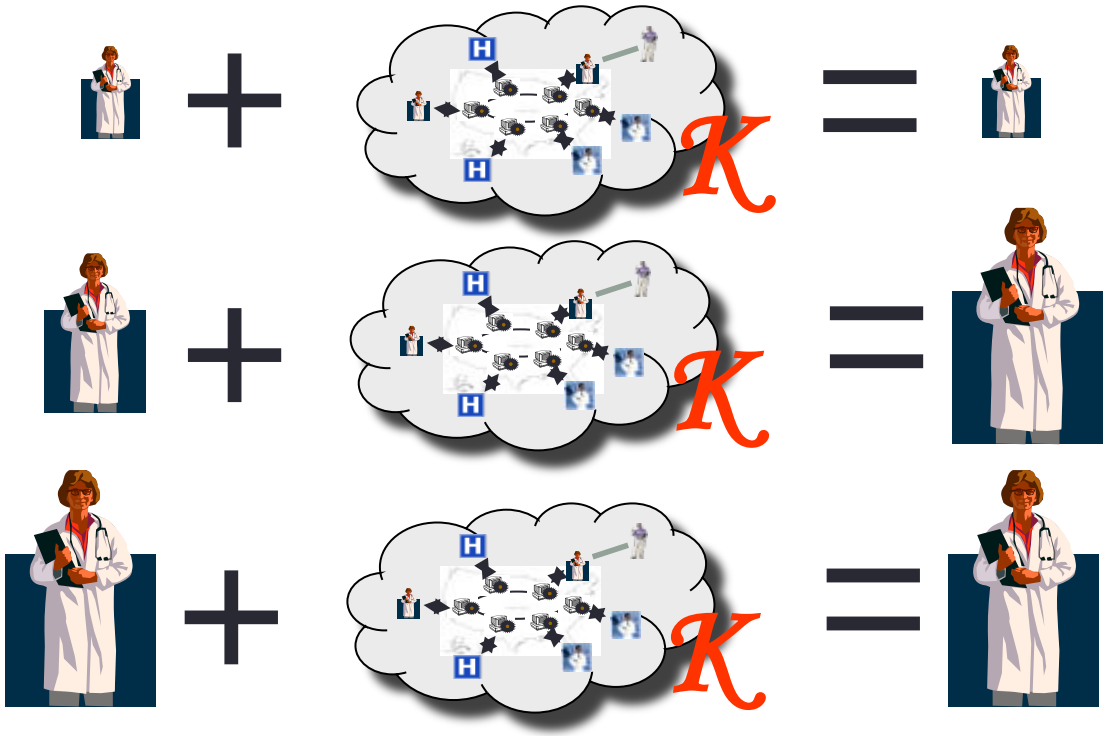
Educational Approaches to Enhance Calibration

- Practice and feedback
  - Build confidence assessment *formally* into clinical teaching
  - Discuss events and consequences of miscalibration episodes
- Modeling by faculty
- Metacognitive techniques*

*Quirk M. Intuition and Metacognition in Medical Education: Keys to Developing Expertise, Springer 2006

Competency 2. Performing with Support from the Knowledge Cloud

You need to know something, to find out what you don't know.

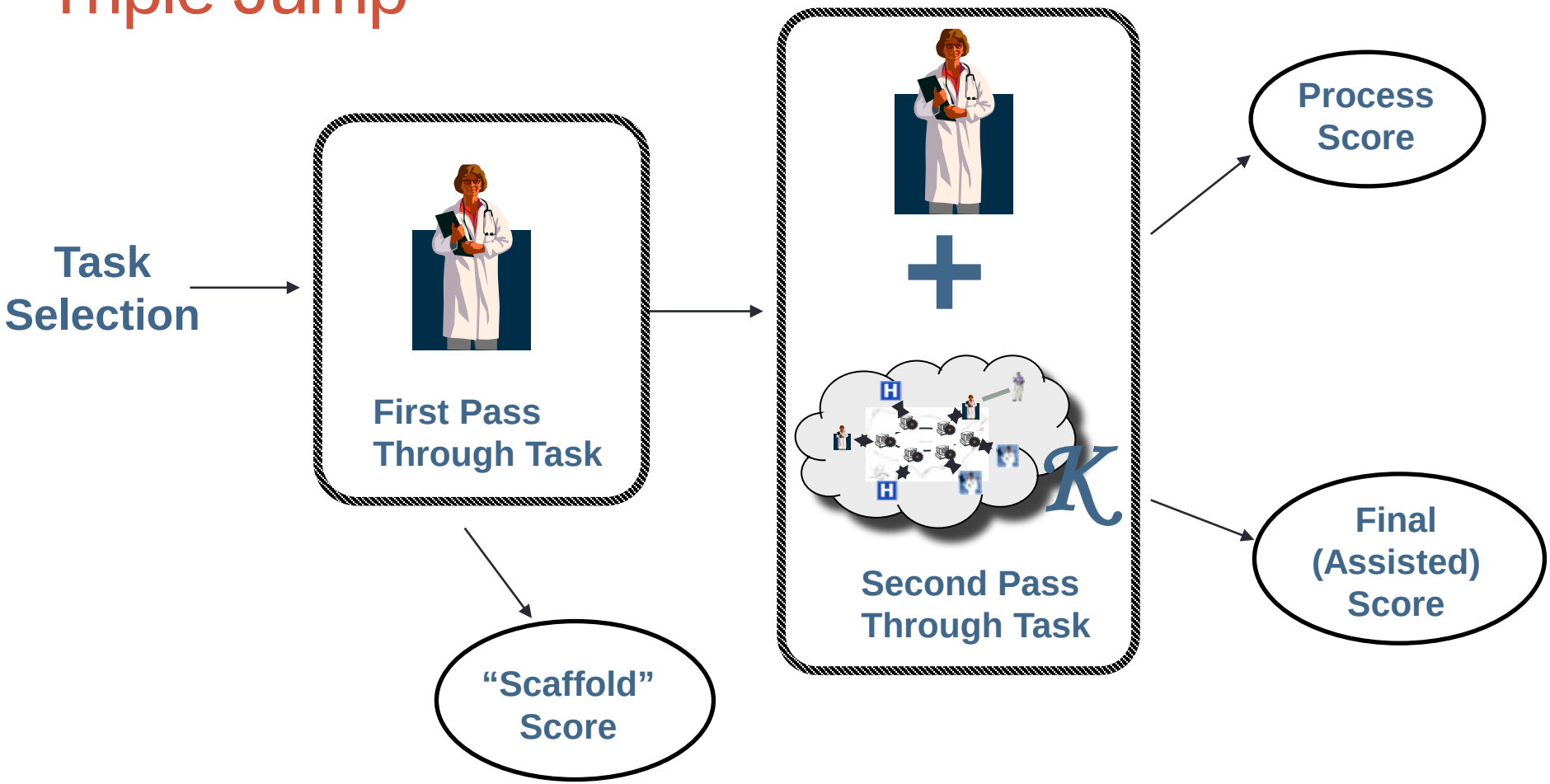


- With nearly zero knowledge, the person cannot frame a question
- With partial knowledge, the cloud can be helpful
- With (nearly) perfect knowledge, the cloud is not needed

Education to Prepare for Cloud-Supported Practice

- Rethink curriculum content. (What do you need to know in order to find out what you don't know?)
  - Stress organization (scaffolding)
  - Practice in formulating good questions
- Emulate the future:
  - Deploy systems for education in advance of their use in practice
  - Give student problems that require the cloud
- Evaluations should be "cloud-compliant"
  - "Open cloud" exams
  - Closed exams should test for scaffolding, not facts
  - Bring back the "Triple Jump"

Cloud-Compliant Evaluation: Return of the "Triple Jump"



Friedman CP, Elstein AS, Wolf FM, Murphy GC, Franz TM, Heckerling PS, Fine PL, Miller TM, Abraham V. Enhancement of Clinicians' Diagnostic Reasoning by Computer-Based Consultation: A Multisite Study of 2 Systems. Journal of the American Medical Association, 282: 1851-1856, 1999.

Competency 3. Evaluating and Weighing Evidence

People remain in charge…

- The Cloud will not make decisions: people will
- The Cloud will give advice, not orders
- The Cloud's advice will rarely be unqualified
- The Cloud will explain its reasoning
- Decisions will involve patients, their families, and other clinicians

Education for Cloud-Supported Decision Making

- Curriculum should include theory and practice of:
  - Decision analysis
  - Evidence-based decision making under uncertainty
  - Critical evaluation of literature
  - Meta-analysis
  - Data mining and signal detection

BUT…

- Should be not be a stand alone. Should be integrated into Cloud-supported education and evaluation (Competency 2).

AND NOTE THAT…

- I said nothing about the curriculum including information technology per se. The technology will “disappear”.

A Sampler of Key Research Questions

1. Knowing what you do and don't know (calibration)
   - How do we assess confidence, as a precursor to addressing calibration?
   - What factors affect calibration?
2. Performing with support from the cloud
   - How much does one need to know to make best use of the knowledge cloud?
   - How to construct the personal knowledge scaffold that makes best use of the cloud?
3. Evaluating and weighing evidence
   - What explanations from the cloud best meet the needs of physicians in training?
   - What models of clinical education are best preparation for cloud-enhanced, participatory social decision making?

Transcendent: How does all of this fit into a framework of continuous, lifelong learning?

In Summary…

- Envisioning the Informational Future
  - What can we reasonably expect by 2020 (plus or minus)?
    - *A digital health system*
    - *A knowledge cloud*
- Implications for Health Professions Education
  - How should these changes shape what we do as educators?
  - What kinds of research are needed to guide us?

Pivots on Three Key Competencies

- *Knowing what you do and don't know*
- *Performing with support from the cloud*
- *Evaluating and weighing evidence*

But Above All…

As educators, let's skate to where the world is going to be in 2020

Thanks and Write to Me:

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